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# The Control of Paratyphoid Infections of Poultry

Paratyphoid control has not kept pace with the control of pullorum disease and fowl typhoid because of the widespread distribution of the paratyphoid organisms and the lack of sufficient information, experience, and effective diagnostic procedures to formulate an acceptable control program that might be presented to the poultry industry. Yet, these infections pose a very important economic problem to the industry.

Approximately sixty Salmonella types other than Salmonella pullorum and S. gallinarum, the causative organisms of pullorum disease and fowl typhoid, respectively, have been reported to infect chickens and turkeys. Salmonella typhimurium is the most frequently encountered paratyphoid of poultry. This organism is especially pathogenic for turkey poults and the incidence of this infection in chickens seems to have increased during the past few years as reflected by the reports of diagnostic laboratories.

Heaviest losses from Salmonella infections occur among young birds during the first month after hatching. The age at which losses start will depend on whether the infection takes place in the incubator or the brooder. The disease spreads rapidly and deaths may continue for several weeks. Birds that survive the infections may remain carriers of the causative organisms. However, Salmonella infections are not frequently encountered as an acute disease in adult birds and infected adults generally show no outward symptoms.

The infection may be spread by way of the egg either by direct transfer from the ovary of the infected hen or by penetration of the egg shell by organisms present in contamination on the surface of the egg. Because of the importance of the latter method of transmission, hatching eggs should be properly handled and only clean eggs used for hatching.

Salmonella organisms are spread from bird to bird by consumption of litter, feed, or water contaminated with infected droppings. Adult birds as well as numerous other animal species may pass large numbers of the organisms in their droppings and readily infect younger birds. Rodent droppings are frequently a very rich source of the organisms. Humans act as mechanical carriers of the organisms through infected material which may adhere to the shoes or clothing.

The following outline summarizes the main points that should be considered in establishing a control program for paratyphoid infections of poultry:

1. Role of the diagnostic laboratory. Chicks and poults that die or are sick, as well as representative reactors to agglutination tests, should be promptly submitted to the diagnostic laboratory for examination. A complete history should accompany the specimens including information relative to the number of birds in the infected broods or flocks, mortality, hatchery or flock source, etc.

It is the responsibility of the laboratory to conduct complete bacteriological tests to detect any Salmonella that may be present. If tests for Salmonella are positive, the flock or hatchery owner as well as disease control personnel within the State should be promptly notified. The laboratory should follow up on all cases by having Salmonella organisms typed and maintain up-to-date and complete records relative to the Salmonella types recovered from each flock within the area.

Information derived from typing the organisms aids in tracing the origin of disease outbreaks and permits those in disease control work to concentrate their efforts toward the eradication of those types that are determined to be most widespread and deadly. Periodic summarizing of this information would be most helpful to the laboratory and those engaged in disease control activities.

2. Blood testing for S. typhimurium infection and the removal of reactors. Blood testing procedures for paratyphoid infections have not developed to the same degree as those used in testing for pullorum-typhoid. Much of the effort in this direction has been centered on the application of a tube agglutination test for S. typhimurium, the most frequently encountered paratyphoid of poultry. The typhimurium test, like the one for pullorum-typhoid, will detect only a limited group of the more than 200 types that make up the Salmonella group. Therefore, it should not be regarded or referred to as a general paratyphoid test, but rather as a typhimurium test.

While the blood test for typhimurium must still be regarded as being in an experimental stage, experience has indicated that it is worthy of more widespread application and study. The Animal Disease and Parasite Research Branch of the Agricultural Research Service is studying typhimurium antigens and their application, in selected field flocks. Both tube agglutination and rapid whole-blood antigens are being included in the study. About six States are presently engaged in testing poultry for S. typhimurium. In most of the States the testing is conducted on a limited scale and mainly among turkey flocks.

The tube agglutination test for S. typhimurium is similar to that for pullorum-typhoid except that two antigens, rather than one, are generally employed to test each blood serum sample. Therefore, the amount of blood collected from each bird must be slightly increased over that collected for the pullorum-typhoid test. The tube test is a laboratory procedure and requires 24 hours for completion. It is, therefore, necessary to provide laboratory facilities for running the tests as well as equipment and personnel.

There are several limitations to a blood testing procedure for typhimurium control. First, it is unlikely that a single test will remove all reactors; thus, several tests at rather short intervals are recommended. Some birds, especially intestinal carriers of the organisms, may not react positively to the test even though they are infected. Finally, the opportunities for re-infection of tested flocks must be carefully considered and prevented. Following the test and removal of reactors, a general cleaning and disinfecting procedure identical to that used in conjunction with pullorum-typhoid testing should be carried out.

3. Rodent and pest eradication campaign. Rodents and various pests around the poultry yards are a rich source of Salmonella organisms for chickens and turkeys. They may pass large numbers of the organisms in their excreta and are able to contaminate feed supplies and water, as well as litter and the poultry yards. An active rodent eradication campaign is an essential part of the general Salmonella control program.

4. Animals, wild and domestic birds, and man as a source of Salmonella. Unlike pullorum disease and typhoid, which are essentially fowl diseases, paratyphoid infections have been found to be carried by a total of 47 animal species. Dogs, cats, sheep, cattle, horses, and swine should never have access to poultry operations. Caretakers should take precautions not to transmit Salmonella infections from these various animal species to the poultry. Instances are on record in which poultry have contracted Salmonella infections from human carriers. In addition, man may carry the organisms from place to place on his hands, clothing and shoes. The dangers of such transmission may be minimized by washing hands, changing coveralls, and disinfecting footwear between poultry and other animal operations.

5. Incubator and egg sanitation. Paratyphoid organisms are capable of penetrating the unbroken egg shell. Hens that are intestinal carriers may lay eggs with Salmonella contaminated shells or the eggs may become contaminated in dirty nests. The presence of moisture or organic matter helps the organisms to live for longer periods of time and also aids their penetration of the egg shell.

Visibly dirty eggs should never be used for hatching. Eggs should be collected at frequent intervals and properly handled after collection. Fumigation of the eggs previous to incubation and also at later stages of incubation will aid in the destruction of Salmonella organisms present on the shell. Formaldehyde gas should be used for this purpose and recommendations of the incubator manufacturer should be closely followed.

After each hatch, incubator egg trays and other readily removable parts should be taken out, washed free of all foreign matter and scrubbed with some disinfectant such as a 2 percent commercial lye solution, a 3 percent solution of cresol or other equally effective material.

6. Chemotherapy. Treatment of Salmonella infections is advisable only as a salvage or preventative measure and exclusively for chicks or poults that are not to be kept as a source of hatching eggs. The sulfa drugs including sulfamethazine, sulfamerazine, and sulfaquinoxaline have been used successfully to reduce death losses from Salmonella infections. Terramycin and aureomycin are the antibiotics of choice in treating acute outbreaks. The duration of therapy is influenced by the severity of each outbreak and flock response.

Furazolidone is effective in checking losses during acute outbreaks of salmonellosis. This drug may also be incorporated in the feed at a lower concentration for continuous feeding to prevent outbreaks and spread of the infection in flocks to be used for market purposes.

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